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Outcomes in patients with hypertension and type 2 diabetes receiving a stent for angina

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Aim. To study the outcomes in hypertensive (HTN) patients receiving a stent for class III angina, depending on concomitant type 2 diabetes (T2D).

Material and methods. The study included 295 patients aged 45 to 75 years. All patients underwent coronary angiography followed by elective stenting. Clinical outcomes were evaluated after outpatient follow-up (average 44 months). Patients were divided into two groups: group 1 — 214 patients with coronary artery disease (CAD) in combination with HTN; group 2 — 81 patients with CAD in combination with HTN and T2D.

Results. In the group of patients without T2D, during the follow-up period, class III angina was observed in 92 patients (43%). The decrease in systolic blood pressure (BP) (SBP) and diastolic BP (DBP) in this subgroup was 18 and 14 mm Hg, respectively (p<0,001); 35 patients (38%) had myocardial infarction (MI). In the group of patients with T2D, class III angina was recorded in 60 patients (74,1%). The decrease in SBP and DBP in this subgroup was 19 and 12 mm Hg, respectively (p<0,001). There were 58 cases of MI in this subgroup (96,7%).

Conclusion. After stent insertion, patients with CAD, HTN and T2D still reporting class III angina were more likely to have MI than patients without T2D. This indicates a greater contribution of T2D to MI development, despite an equal decrease of SBP in patients with/without T2D.

Key words: hypertension, myocardial infarction, diabetes, systolic blood pressure, angina of effort.

Relationships and Activities: not.

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It is known that the combination of coronary artery disease (CAD) with hypertension (HTN) significantly worsens the prognosis of patients [1]. Cardiovascular diseases remain the main cause of morbidity and mortality in patients with type 2 diabetes (T2D) [2]. The combination of CAD with T2D significantly worsens the prognosis of patients. In this regard, patients with T2D and concomitant cardiovascular diseases are at a very high risk [3].

Severe angina requires measures to improve the quality of life by reducing myocardial ischemia. In this regard, along with pharmacotherapy, coronary artery revascularization is effectively used. However, the presence of angina pectoris after coronary stenting is observed in 20-40% of patients [4]. There is very little data on angina in T2D patients with HTN after coronary stenting and on outcomes in the long-term follow-up [5].

The aim was to study the outcomes in HTN patients receiving a stent for class III angina, depending on concomitant T2D.

Material and methods

The study included 295 patients aged 45 to 75 years (mean age 61,35±8,2 years). All patients signed informed consent. There were following inclusion criteria: age <75 years, CCS class III angina, HTN with BP ⩽180/110 mm Hg, sinus rhythm, signed informed consent. The exclusion criteria were: age >75 years, not signed informed consent, stage ⩾2 heart failure, a history of cerebrovascular accident, severe kidney (creatinine >160 μmol/L) and liver failure (transaminase levels ⩾3 times the normal range), any heart rhythm disorders requiring treatment, second- and third-degree atrioventricular block, bradycardia (⩽50 bpm), sinoatrial block, respiratory failure (⩾II degree), ineffective contraception in women of reproductive age, pregnancy and lactation, alcoholism and drug addiction, history of cancer.

We assessed the following parameters in all patients: a complete blood count; lipid profile; levels of creatinine, glucose, and blood potassium. Electrocardiography, echocardiography, and coronary angiography (CA) were performed. All patients underwent coronary stenting followed by dual antiplatelet and statin therapy. Conventional antihypertensive therapy was chosen taking into account the individual response of patients and was continued after hospitalization.

All patients were divided into two groups: group 1 (n=214) — patients with CAD and HTN; group 2 (n=81) — patients with CAD in combination with HTN and T2D.

The clinical course of angina was evaluated by questioning of patients. Assessment of BP parameters was based on data of patient self-monitoring. The dynamics of angina and HTN severity were evaluated on average 44 months after discharge from the hospital by telephone survey.

Statistical processing was carried out using the Statistica 6.0 software package (StatSoft Inc., USA). Normality of distribution was determined using the Shapiro-Wilk test. To describe normally distributed quantitative traits, the arithmetic mean (M) and the standard deviation (σ) were considered as M±σ. To describe the sampling distribution of non-normally distributed quantitative traits, we used the median (Me), lower (25%) and upper (75%) quartiles (Q_1 and Q_3) as Me [Q_1; Q_3]. The statistical significance of quantitative trait differences was evaluated by the nonparametric Mann-Whitney U test, and qualitative traits — by the Pearson's chi-squared test. Relative frequencies and their 95% confidence intervals (CI) were estimated to describe the qualitative traits. To identify the association between laboratory and instrumental parameters, nonparametric Spearman's correlation analysis was used. To assess the significance of differences between groups, the nonparametric Wilcoxon test was used.

Results

Data on laboratory parameters are shown in Table 1. Significant differences in laboratory parameters were revealed regarding the levels of high-density lipoprotein cholesterol (which were higher by 1,9% in the group without T2D patients) and plasma creatinine (which were higher by 6,9% in the group without T2D patients).

In the group of patients without T2D, during the follow-up, class III angina persisted in 92 patients (43%). The decrease in systolic (SBP) and diastolic BP (DBP) in this subgroup was 18 and 14 mm Hg, respectively (p<0.001), while 35 patients (38%) had MI (Table 2). In the group of patients with T2D, class III angina persisted in 60 patients (74,1%). The decrease in SBP and DBP in this subgroup was 19 and 12 mm Hg, respectively (p<0,001). There were 58 (96,7%) cases of MI in this subgroup (Table 3).

In 122 patients without T2D (57%), angina progression from class III to IV was observed. The decrease in SBP and DBP in this subgroup was 10 and 18 mm Hg, respectively. During the follow-up period, 110 cases of MI (90,2%) and 10 cases of acute cerebrovascular accident (CVA) were recorded (Table 2). In 21 patients with T2D (26%), angina progression from class III to IV was observed. The decrease in SBP and DBP in this subgroup was 18 and 7 mm Hg, respectively (p<0,001 and p=0,05); during the follow-up period, 17 cases of MI (80,9%) and 4 cases of acute CVA were recorded (Table 3).

Table 1

Comparison of laboratory parameters

Parameter	Group I, n=214	Group II, n=81	P
	Me [Q_1;Q_3]	Me [Q_1;Q_3]	
Age, years	61,00 [56,00;68,00]	62,00 [57,00;66,00]	0,36
Plasma potassium, mmol/L	4,70 [4,30;5,00]	4,70 [4,40;5,00]	0,73
TC, mmol/L	5,32 [4,32;6,21]	5,38 [4,64;6,12]	0,70
HDL-C, mmol/L	1,04 [0,89;1,25]	1,02 [0,84;1,16]	0,047
LDL-C, mmol/L	3,20 [2,47;4,10]	3,15 [2,50;4,04]	0,94
Creatinine, μmol/L	98,00 [87,10;109,00]	91,20 [83,30;107,90]	0,026
Blood glucose level, mmol/L	5,51 [5,20;5,97]	7,89 [6,55;10,09]	<0,001
Leukocyte count, $x10^9$/L	6,50 [5,65;7,60]	6,79 [5,70;8,35]	0,15

Abbreviations: TC — total cholesterol, HDL-C — high density lipoprotein cholesterol, LDL-C — low density lipoprotein cholesterol.

Table 2

Changes in angina classes and BP levels in patients without T2D at the beginning and end of the study

Classes of angina and complications	Number of patients	Δ SBP, mm Hg	Δ DBP, mm Hg
Class III angina → Class III angina	92	18*	14
MI	35		
CVA	0		
Class III angina → Class IV angina	122	10*	18
MI	110		
CVA	10		

Notes: * — p<0,05, Δ — the difference between the pressure at the beginning and at the end of the study.
Abbreviations: DBP — diastolic blood pressure, MI — myocardial infarction, CA — coronary angiography, CVA — acute cerebrovascular accident, SBP — systolic blood pressure.

Table 3

Changes in angina classes and BP levels in patients with T2D at the beginning and end of the study

Classes of angina and complications	Number of patients	Δ SBP, mm Hg	Δ DBP, mm Hg
Class III angina → Class III angina	60	19*	12*
MI	58		
CVA	0		
Class III angina → Class IV angina	21	18*	7
MI	17		
CVA	4		

Notes: * — p<0,05, Δ — the difference between the pressure at the beginning and at the end of the study.
Abbreviations: DBP — diastolic blood pressure, MI — myocardial infarction, CA — coronary angiography, CVA — acute cerebrovascular accident, SBP — systolic blood pressure.

Discussion

Epidemiological data suggest that HTN and T2D are often combined. Pathophysiology of T2D and HTN has much in common, leading to a mutual increase in the risk of cardiovascular events, despite adequate glycemic and BP control. One of the large studies with 99,720 HTN patients and 12,7-year follow-up, including 7480 patients with T2D and 244,816 normotensive patients was conducted. During the follow-up period, 14,050 deaths were recorded, while the mortality among T2D patients was higher than among hypertensive patients without T2D: all-cause mortality — 14,05% vs 7,43%, cardiovascular mortality — 1,28% vs 0,7%, respectively [6].

Another adverse combination is T2D and CAD. The data obtained by a coronary computed tomographic angiography showed that T2D patients have a greater severity of coronary artery lesions both in relation to the extent and prevalence of atherosclerosis [7].

There are several suggestions regarding the mechanisms of atherosclerosis progression in patients with T2D. Different phases of coronary artery atherosclerosis are regulated by various mechanisms, and T2D accelerates the occurrence of cardiovascular events due to accelerated progression of atherosclerosis, since many glucose-induced signaling mechanisms are mediated by active lipids. Activation of the receptors of advanced glycation end products is considered as a mediator of atherogenesis. Inflammation is also important, in which both high glucose levels and modified lipoproteins or saturated fatty acids take part [8].

The importance of coronary stenting with optimal pharmacotherapy in reducing the angina symptoms remains controversial [9]. In the widely discussed ORBITA study [10], the benefits of coronary stenting compared with placebo remained unknown, but this study is criticized because of its methodological limitations [11]. According to the researchers, one of the possible mechanisms for angina persistence after stenting is microvascular angina [10], which is also present in T2D. Stent placement can cause or exacerbate coronary microvascular dysfunction, increasing the tendency to coronary epicardial vasospasm. According to the authors, combination of these mechanisms can be the causes of angina after stenting in almost half of patients [4].

Clinical outcomes and severity of angina 1, 6 and 12 months after stenting were presented in the US registry, which included 10 medical centers [5]. Among 1080 patients, 34% had T2D. The severity of angina was the same among patients with/without T2D. T2D patients received calcium channel blockers and long-acting nitrates in addition to beta blockers. A multivariate analysis revealed that after 1 year the risk of angina was the same in patients with/without T2D (relative risk 1,04; 0,80-1,36). The authors concluded that patients with CAD and T2D had the same severity of angina as patients without T2. The authors concluded that patients with CAD and T2D had the same severity of angina as patients without T2D. These data contradict the generally accepted opinion that in patients with T2D, the manifestations of angina are less pronounced due to the silent myocardial ischemia.

Study limitations: a small sample, especially among patients with T2D; using a telephone survey.

Conclusion

In patients with CAD, HTN and T2D, despite the persistence of class III angina after coronary stenting, a greater number of MI cases occurred during the follow-up period than in the group of patients without T2D. This indicates a greater contribution of T2D to MI development, despite an equal decrease of SBP in patients with/without T2D.

Relationships and Activities: not.

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